

EFFECT OF SMALL PARTICLES OF DRY FRUITS IN PHYSIC -CHEMICAL PROPERTIES OF VALUE ADDED APPLE CHEESE

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ABSTRACT

The present investigation entitled " Effect of small particles of dry fruits in physic -chemical properties of value added apple cheese " was carried out in Post-Harvest Lab, Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences, (Deemed to be University) during the winter season of 2013. The experiment was laid out in CRD with 10 treatments and 3 replications for preparation of a apple cheese. From the present investigation it can be concluded that treatment T₉ (fruit pulp + 15% Almond) proved to be the best in terms of quality, sensory score, apple cheese at room temperature.

KEYWORDS: Apple, Dry Fruits, Cheese and Butter

INTRODUCTION

Apple (*malus domestica Borkh*), belongs to the family of Rosaceae, and sub family Pomoideae. The genus Malus has 17 basic chromosome numbers with somatic chromosome number of 34, sometimes 51, 60 & 85. (Wilcox, 1962).

Amongst the various temperate fruit grown in the country, apple was the most important fruit which accounts for percent of total area and 75% of the total production of temperate fruits in the country (CHANDHA 1992).

The major apple producing states of the India were Jammu and Kashmir, Himachal Pradesh, U.P. (North Hills) and Arunachal Pradesh. India was the second largest producer of apple fruit, where as Jammu & Kashmir and Himachal Pradesh, U.P. (North Hills) and Arunachal Pradesh. India was the second largest producer (1158.3 m tones) of fruit was the country's largest apple producing state, contributing 94% of total produce. Its production was a 1622.085 mha and productivity 6.4mt/Ha. (NHB Data Base-2011-12).

Apple was highly nutritive food. It contains minerals and vitamins in abundance. The food value of the apple was chiefly constituted by its contents of sugar which ranges from 9 to 11% of this, fruit sugar constitutes 60% and glucose 25% and cane sugar only 15% per 100gm of apple contains moisture 84% protein 0.2% Fat 0.5% Minerals 0.3% Fiber 1.0% carbohydrates 13.4% among mineral and vitamins it contains 10 mg of Ca, 14mg of phosphorus and 1 mg iron per 100gm of fruit 100 gm of apple gives calorific values of 59 Calories.

Thus fruits are an important supplement of the human diet as they possess almost all the nutritive components required for the growth and development of the human body leading to a healthy physique and mind. Also these were a ready source of energy with a unique capacity to guard against many deficiency diseases. Fruits and vegetables were highly perishable commodities- "as they were living tissues that were subject to continuous changes after harvest at this scale the post harvest losses were Rs. 6000 to 7000 crores per annum. Even if 10 % of this could be save by converting them into

processed products at peak production season, there will be saving of Rs. 650 crores per annum to horticultural wealth of the country. But processing industry at present was utilizing only about 1.8 percent of total production for processing (NHB 2001- 2002).

Apple was processed into few popular products like Jam preserve, chutney and cider; besides these products Apple has tremendous scope for the preparation of new products like cheese. In India very less work was carried out in apple preservation especially in case of cheese. It was highly nutritive, having good keeping quality, remunerative and has good export potential. Cheese was only one product which can be preserved for long duration and available through out the year. Therefore it was very important to conduct research to develop the new recipes and for value addition from different cultivators of apple. In preparation of apple cheese dry fruits such as cashew, almonds, peanuts etc. plays an important role in improving the nutrition value of apple cheese through value addition

MATERIALS AND METHODS

The present investigation entitled " Effect of small particles of dry fruits in physico-chemical properties of value added apple cheese " was carried out in Post-Harvest Lab, Department of Horticulture , Sam Higginbottom Institute of Agriculture Technology and Sciences, (Deemed to be University) Allahabad during the year 2013. Raw materials apple fruits were procured from the local market of Allahabad on first October 2013 bred at Allahabad then stored in the research Post harvest laboratory of Department of Horticulture, Sam Higginbottom Institute of Agriculture, Technology & Sciences (Deemed-to-be-University), Allahabad on the another day at room temperature the processed started with apple cheese .

Materials for Value Added

After calculating the amount of fruit pulp, sugar, butter, citric acid and value additive was added on the following rates:

- Sugar 750 gm/kg of pulp
- Butter 70-75 gm/kg of pulp
- Citric acid 2-3 gm/kg of pulp

Selected fresh fruits, Washed fruits cut into pieces and boil with equal quantity of water. Mesh and removed pomace by sieving. Add sugar, butter, value additive & citric acid cooked till mixture becomes sufficiently thick. Removed from fire .When the mixture starts leaving sides of pan. Addition of nuts by 5%, 10% and 15% cashew, walnuts and Almond Spread hot cheese in 0.6 cm thick layer on tray smeared with butter Cut into small pieces with a sharp knife. Pre-packed with butter paper and then packed in polythene. Packed in dry jar Store at ambient temperature in dry place at intervals 0, 30, 60, and 90 days it was chemical analysis, sensory and microbial each period.

Physiochemical Analysis

The total soluble solids in the samples were directly recorded by hand refractrometer and the results were expressed as per cent soluble solids (°Brix) and the values were corrected at 20°C. Product pH was measured by using an electronic pH meter. The pH meter was standardized by using buffers of pH 7.00 and 4.00 prior to recording pH of the samples. The Ascorbic acid and Acidity was determined by using as describe by **Larmond (1987)**.

The titratable acidity (TA) of apple cheese was measured as described by **Maul *et al.* (2000)**. The titratable acidity expressed as percent citric acid was obtained by titrating 10 ml of apple cheese with standard NaOH (about 0.1 N) to the end point (persisting for 15 s). The titratable acidity was then expressed as percent citric acid. On the other hand, the ascorbic acid content of tomato ketchup was determined using 2, 6-dichlorophenol indophenol method (**AOAC, 1970**). A 10-ml aliquot of apple cheese was diluted to 50 ml with 3 percent met phosphoric acid in a 50 ml volumetric flask. The mixture was titrated with the standard dye to the end point (persisting for 15 s). The ascorbic acid content was calculated from the titration value, dye factor and volume of the sample.

Sensory Evaluation

Standard sensory evaluation procedures were followed to perform descriptive analysis; panelists were trained using repeated round table and individual evaluations of trial formulations of the control and value added samples. Hedonic scale method as described by **Steel (1997)**.

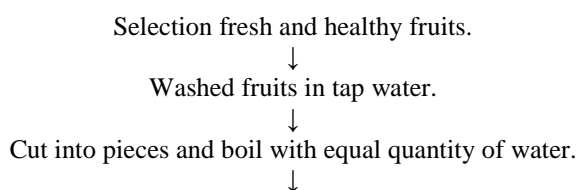
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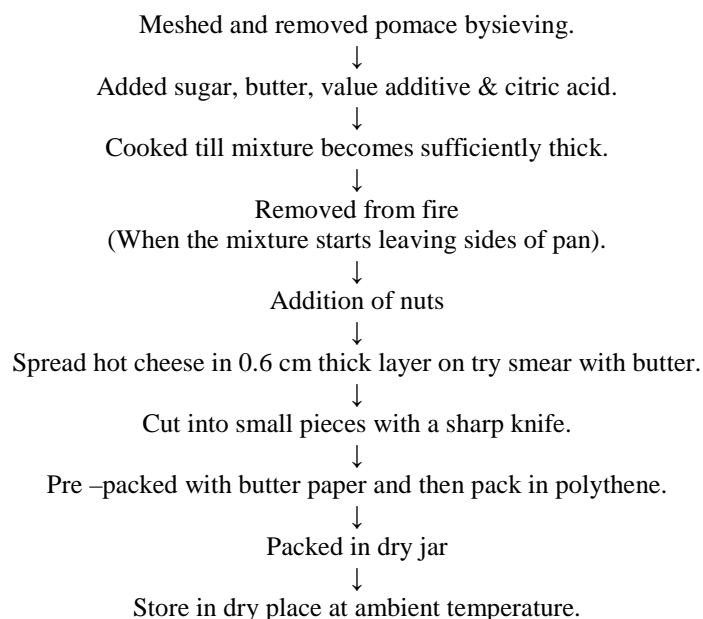
The data obtained was subjected to statistical analysis to find out the impact of storage period, different study materials and temperatures on the quality of the products during storage .A complete randomized design was applied for the analysis (Gomez and Gomez, (1984).

Treatment Combinations for Value Added Apple Cheese.

Treatments	Notations
Control (Standard recipe only)	T ₀
Fruit pulp + 5% cashew.	T ₁
Fruit pulp + 10% cashew.	T ₂
Fruit pulp + 15% cashew.	T ₃
Fruit pulp + 5 % walnuts	T ₄
Fruit pulp + 10% walnuts .	T ₅
Fruit pulp + 15% walnuts .	T ₆
Fruit pulp + 5 % Almond .	T ₇
Fruit pulp + 10% Almond.	T ₈
Fruit pulp + 15% Almond.	T ₉

Flow Chart of Apple Cheese Preparation





RESULTS AND DISCUSSIONS

Acidity

Acidity was an important attribute because tartness was a major factor in the acceptability of apple cheese. Acid gives the Characteristic sourness to the product. Citric acid was the major acid in apple that enhances the characteristic flavor of apple cheese. Ready to serve was presented in Table 1. Data showed that treated sample differ from control for the parameter of acidity. Highest acidity (0.96) was record in T₀ Control (Standard recipe only) while lowest (0.62) was observed in T₉ Fruit pulp+ 15% Almond .The data was found to reveal statistically at 0, 30, 60 and 90 days of storage The data regarding acidity in different treatments of This was gradual increase in acidity in all treatments during storage up to 90 days. Similar finding have been reported by **Ranganna (2001)** in apple pomace **Sogi and Singh (2001)** in Kinnow Jam and Candy.

TSS

The data on Total Soluble Solids (TSS) for all treatments has been presented in Table 1 TSS of apple cheese was found to increase with increase in storage duration. After 90 days of storage, the initial stage. The effect of treatments on TSS changes was observed significantly. The lowest mean TSS (75.40 °Brix) was recorded in T₀ (untreated control). After that the highest TSS (78.78 °Brix) was observed in T₉ (Fruit pulp+ 15% Almond). TSS was found gradually increased with increase in storage period. This might be due to the conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with storage. Increase in TSS with storage was also by **Iftikhar Shakir et al. (2007)**. the increase in the T.S.S. of apple cheese may be due to hydrolysis of polysaccharides to monosaccharide's (sucrose, fructose, glucose). Similar finding has been reported showed **Ali Muhammad et al. (2008)** in jam apple.

pH

The pH has great importance to maintain shelf stability; pH can also influence the flavor and processing requirements of the apple cheese the data about pH (Table 1) indicated that there was a variation in control and value added treatments The highest mean pH (3.88)observed inT₀ (untreated control).while the lowest mean pH (3.31) was observed in T₁ (Fruit pulp + 5% cashew)) Increase might be due to the slight growth of micro-organism in the beverage The data about pH **Ehsan *et al.* (2003)** in grapefruit apple marmalade. **Ali Muhammad *et al.* (2008)** in apple jam.

Ascorbic acid

Marginal differences in ascorbic acid contents were observed in various treatments. Treated samples also differed from control samples with respect to ascorbic acid contents (Table 1). Statistical Analysis showed that the results were highly significant for storage period. Ascorbic acid contents decreased significantly at all storage intervals. These losses of ascorbic acid were attributed to the effect of processing, storage time and exposure to light. Highest ascorbic acid (2.70) was recorded in T₇ (Fruit pulp+ 5 % Almond) and (2.66) followed byT₈ (Fruit pulp+ 10% Almond), While lowest (2.33) was observed in T₆ (Fruit pulp + 15% walnuts). The degradation of ascorbic acid in apple cheese may follow aerobic and an-aerobic pathways. The ascorbic acid content in apple cheese was showed decreasing trend in all values addition. Similar has been reported in ascorbic acid during storage were in conformity with the results obtained by **Jawaheer *et al.* (2003)** processing and storage of guava into jam and juice on the ascorbic acid content.

Color and Appearance

The data on effect of additive on color and appearance of apple butter stored at room temp were shown in Table. The data was found statistically significant at 0, 30, 60 and 90 days of storage. The color and appearance was probably due to setting abilities of different value added apple cheese prepared from different value additive. Pectin present in the fruit was responsible for setting the value of added apple cheese since more pectin content leads to early end point and less cooking. The effect of treatments on color and appearances on apple cheese was shown in Table 2. T₉ (Fruit pulp+ 15% Almond.) ranked highest for Color and appearance of this (7.95 score) followed by T₃ (Fruit pulp+ 15% cashew) (7.31 score). T₀ (Control) was (4.84 score) ranked lowest as regard to its Color Appearance characteristics. Storage had a significant effect on color perception of apple cheese. The ranked highest for Color and Appearance were observed when it was freshly prepared in T₉ (Fruit pulp+ 15% Almond).

Texture/ Body

The data on effect of value additive material on texture of apple cheese stored at room temp was shown in Table 2. The data was found statistically significant at 0, 30, 60 and 90 days of storage. The texture showed increasing trend in all treatment. Texture and body of the apple cheesewas affected significantly by treatments. T₉(Fruit pulp+ 15% Almond.) Got (7.75 score) the maximum score for texture and body was followed by (7.26 score) T₃ (Fruit pulp + 15 % cashew.).The lower texture and body perception (4.93 score) was recorded in T₀ (Control (Standard recipe only). A significant variation was observed in flavor perception of apple cheese .The texture was directly related to the setting of product and setting was a result of good pectin.

Flavour/ Taste

In organoleptic evaluation flavor and taste was very important factor after color and texture. Statistical Analysis revealed a significant effect. The data on effect of additive food material on flavor of apple cheese stored at room temperature were shown in Table 2. The data was found statistically significant at 0, 30, 60 and 90 days of storage. In organoleptic evaluation flavor and taste was very important factor after Flavor and taste. Statistical Analysis revealed a significant effect of treatment and storage on flavor and taste apple cheese T₉ (Fruit pulp+ 15% Almond.) sample (7.64 score) got higher scores of flavor and taste was followed by (7.16 score) T₃ (Fruit pulp+ 15% cashew). The lower Flavor and taste (4.87 score) was recorded in T₀ (Control (Standard recipe only)). An appropriate combination of acid and sugar result in the product with a good taste. The same quantity of sugar and acid was added to all the treatment.

Overall Acceptability

The data on effect of value additive on overall acceptability of apple cheeses stored at room temperature were shown in Table 2. The data was found statistically significant at 0, 30, 60 and 90 days of storage. Overall acceptability was influenced significantly with the treatment. Higher level of could not produce top acceptability due to deviation from standard Color, Texture, Flavor of the product retained after 90 Days of storage The overall acceptability showed increasing trend in all treatment. The initial overall acceptability was recorded of storage among the different additive the maximum score (7.79) was observed in T₉ (Fruit pulp+ 15% Almond) followed by (7.25) T₃ (Fruit pulp+ 15% cashew.) and minimum change (4.99) was observed in T₀ control (standard recipe only). However the organoleptic characters showed a gradual increase during the storage period up to 90 days.

The sensory of the apple cheese was evaluated in terms of color, aroma, taste, and overall acceptability; average scores of sensory attributes during storage was reported in Table 2 statistically, interaction no significant effect on the sensory profile. In this work apple cheese showed no significant variations of sensorial parameter scores after storage. In this sense, **Chauhan *et al.* (2012)** reported that the sensory attributes for color, appearance, flavor, Texture, Body and overall acceptability of the jam samples showed a decreasing trend, while the spread ability remained almost constant throughout the storage period. **Ali Muhammad *et al.* (2008)** Overall acceptability plays an important role in product development. Results regarding overall acceptability of jam samples showed that overall acceptability (determined with the average grading of color, taste and texture) gradually decreased in all samples during storage.

Table 1: Effect of Treatments on Physiochemical Properties of Apple Cheese

	Acidity (%)					TSS (° Brix)					Ascorbic Acid (mg. /100g)					pH				
	Days after Storage					Days after Storage					Days after Storage					Days after Storage				
	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean
T ₀	0.92	0.94	0.99	1.00	0.96	74.00	75.65	75.91	76.04	75.40	2.55	2.52	2.50	2.47	2.51	4.35	3.80	3.72	3.66	3.88
T ₁	0.88	0.89	0.90	0.91	0.90	76.32	77.23	77.80	78.70	77.51	2.51	2.47	2.45	2.43	2.47	3.40	3.31	3.29	3.22	3.31
T ₂	0.62	0.63	0.65	0.75	0.66	76.91	77.35	79.05	80.02	78.33	2.49	2.44	2.42	2.40	2.44	3.68	3.61	3.52	3.47	3.57
T ₃	0.64	0.68	0.69	0.69	0.68	74.71	75.09	76.11	77.00	75.73	2.40	2.37	2.34	2.32	2.36	3.70	3.55	3.40	3.27	3.48
T ₄	0.88	0.89	0.90	0.91	0.90	75.00	75.32	75.81	76.00	75.53	2.40	2.38	2.35	2.34	2.37	3.92	3.70	3.66	3.60	3.72
T ₅	0.86	0.87	0.87	0.88	0.87	74.99	75.02	75.10	75.60	75.18	2.36	2.34	2.32	2.33	2.34	3.78	3.66	3.62	3.58	3.66
T ₆	0.65	0.67	0.67	0.69	0.67	73.41	74.92	75.00	75.00	74.58	2.35	2.34	2.32	2.29	2.33	3.79	3.68	3.64	3.60	3.68
T ₇	0.87	0.88	0.89	0.89	0.88	75.90	75.98	76.24	76.80	76.23	2.75	2.72	2.70	2.63	2.70	3.94	3.78	3.68	3.62	3.76
T ₈	0.65	0.69	0.70	0.70	0.69	76.11	76.33	77.00	77.31	76.69	2.70	2.67	2.65	2.61	2.66	3.32	3.17	3.07	2.98	3.14
T ₉	0.60	0.61	0.62	0.64	0.62	77.00	78.09	80.01	80.03	78.78	2.67	2.65	2.64	2.53	2.62	3.52	3.42	3.37	3.27	3.40
F- test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CV	0.319	0.595	0.723	0.519	0.401	0.647	0.455	0.777	1.185	0.650	0.254	0.129	0.269	0.202	0.242	0.332	0.262	0.292	0.293	0.393
S.E.m. (±)	0.070	0.096	0.107	0.092	0.079	0.988	0.832	1.092	1.353	0.997	0.113	0.080	0.115	0.099	0.110	0.158	0.137	0.143	0.142	0.167
C.D.at 5%	0.148	0.205	0.227	0.195	0.169	2.105	1.772	2.327	2.882	2.123	0.241	0.171	0.245	0.211	0.233	0.335	0.291	0.304	0.302	0.356

Table 2: Effect of treatments on Organoleptic Properties of Apple Cheese

	Colour					Texture/ Body					Flavour/ Taste					Overall Acceptability				
	Days after Storage					Days after Storage					Days after Storage					Days after Storage				
	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean	0	30	60	90	Mean
T ₀	5.40	5.17	4.17	4.60	4.84	5.20	5.00	3.90	5.63	4.93	5.60	5.17	4.10	4.60	4.87	5.52	5.20	4.08	5.16	4.99
T ₁	5.80	6.17	5.00	5.40	5.59	6.15	6.33	5.40	6.20	6.02	6.10	6.17	5.17	5.60	5.76	5.86	6.17	5.10	5.84	5.74
T ₂	6.10	6.17	5.60	5.90	5.94	5.47	6.50	5.60	6.60	6.04	5.70	5.88	5.50	6.10	5.80	5.81	6.17	5.80	6.26	6.01
T ₃	7.15	7.04	7.70	7.35	7.31	7.20	7.00	7.65	7.20	7.26	6.75	6.96	7.53	7.40	7.16	7.08	6.84	7.67	7.42	7.25
T ₄	6.10	6.54	6.60	6.30	6.39	6.40	6.63	6.50	6.78	6.58	6.30	6.67	6.70	6.40	6.52	6.20	6.62	6.52	6.59	6.48
T ₅	6.40	6.29	6.80	6.40	6.47	6.20	6.68	6.85	6.48	6.55	6.50	6.46	7.15	7.00	6.78	6.34	6.52	6.88	6.66	6.60
T ₆	6.75	6.83	7.05	6.40	6.76	6.70	7.00	7.15	6.83	6.92	6.30	6.92	7.30	7.00	6.88	6.72	6.76	7.14	6.95	6.89
T ₇	6.30	6.79	6.50	6.80	6.60	5.60	6.67	6.00	7.00	6.32	6.20	6.88	6.60	6.87	6.64	6.23	6.77	6.32	6.63	6.49
T ₈	6.80	6.58	6.80	6.80	6.75	6.70	6.79	7.00	6.72	6.80	5.95	6.38	6.20	6.80	6.33	6.46	6.79	6.75	6.72	6.68
T ₉	7.70	7.63	9.00	7.45	7.95	7.35	7.38	8.50	7.75	7.75	6.85	7.54	8.50	7.65	7.64	7.41	7.49	8.73	7.52	7.79
F-test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
CV	0.177	0.128	0.241	0.288	0.336	0.431	0.425	0.425	0.055	0.501	0.669	0.891	1.034	1.502	1.195	0.839	0.955	1.103	1.247	1.444
S.E.m. (±)	0.151	0.129	0.177	0.191	0.208	0.233	0.237	0.234	0.086	0.255	0.289	0.340	0.366	0.443	0.392	0.327	0.353	0.379	0.405	0.433
C.D. at 5%	0.322	0.275	0.377	0.407	0.444	0.496	0.504	0.499	0.182	0.544	0.615	0.725	0.779	0.944	0.835	0.696	0.752	0.807	0.863	0.922

CONCLUSIONS

From the present investigation it can be concluded that treatment T₉ (fruit pulp + 15% Almond) proved to be the best in terms of quality, sensory score, of value added apple cheese at room temperature. Since these findings were based on two year trial and therefore, further experiment may be needed to substantiate the result. All of the sensory parameters decline slightly during storage but remain in acceptable region even after 90 days of storage.

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